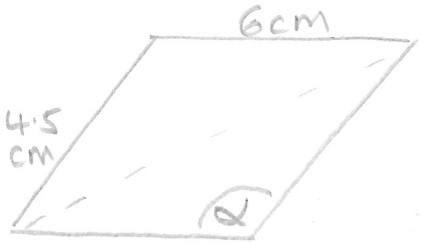
Lower Sixth AL Maths Homework – Week 9/10 **Name:** Answers

6 A parallelogram has sides of length 6 cm and 4.5 cm.

The larger interior angles of the parallelogram have size α

Given that the area of the parallelogram is 24 cm^2, find the exact value of $\tan\alpha$

[4 marks]



$2 \times \frac{1}{2}ab\sin C = \text{Area}$

$\therefore 6 \times 4{\cdot}5 \times \sin\alpha = 24$

$27\sin\alpha = 24$

$\sin\alpha = \frac{24}{27} = \frac{8}{9}$

obtuse so only sinα is positive

$\sqrt{9^2 - 8^2} = \sqrt{17}$

$\therefore \tan\alpha = -\frac{8}{\sqrt{17}}$

7 Solve the equation

$$\sin\theta\tan\theta + 2\sin\theta = 3\cos\theta \quad \text{where } \cos\theta \neq 0$$

Give **all** values of θ to the nearest degree in the interval $0° < \theta < 180°$

Fully justify your answer.

[5 marks]

$\sin\theta\tan\theta + 2\sin\theta = 3\cos\theta$

$\div\cos\theta$ $\quad \frac{\sin\theta\tan\theta}{\cos\theta} + \frac{2\sin\theta}{\cos\theta} = \frac{3\cos\theta}{\cos\theta}$

$\tan^2\theta + 2\tan\theta = 3$

$\tan^2\theta + 2\tan\theta - 3 = 0$

$\therefore \tan\theta = 1$ or $\tan\theta = -3$ (calc)

$\theta = 45°$ $\quad \theta = -71{\cdot}6°$ (out of range)

$\theta = -71{\cdot}6° + 180$

$\therefore \theta = \{45°, 108°\}$

to the nearest degree.

12. (a) Solve, for $-180° \leqslant x < 180°$, the equation

$$3\sin^2 x + \sin x + 8 = 9\cos^2 x$$

giving your answers to 2 decimal places.

(6)

(b) Hence find the smallest positive solution of the equation

$$3\sin^2(2\theta - 30°) + \sin(2\theta - 30°) + 8 = 9\cos^2(2\theta - 30°)$$

giving your answer to 2 decimal places.

(2)

a) $3\sin^2 x + \sin x + 8 = 9(1 - \sin^2 x)$

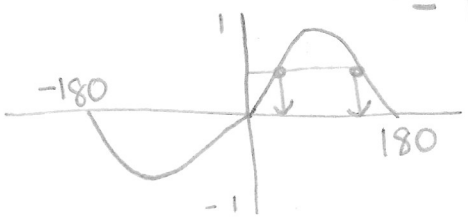
$3\sin^2 x + \sin x + 8 = 9 - 9\sin^2 x$

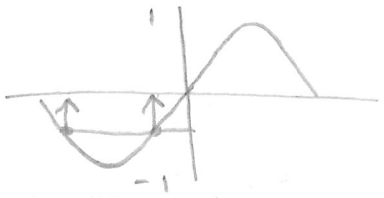
$12\sin^2 x + \sin x - 1 = 0$

$\therefore \sin x = \frac{1}{4}$ or $\sin x = -\frac{1}{3}$

$x = 14.478$, $180 - 14.478 = 165.522$

$x = -19.471$, $-180 + 19.471 = -160.529$





$\therefore \theta = \{14.48, 165.52, -19.47, -160.53\}$ to 2dp.

b) $2\theta - 30 = -19.471$ ← (will give the smallest +ve solution)

$2\theta = 10.529$

$\theta = 5.2645$

∴ Smallest possible solution is $\theta = 5.26$ (to 2dp)

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